DOI:
10.1093/eurpub/ckx223

Document Version
Peer reviewed version

Waterpipe tobacco smoking prevalence among young people in Great Britain, 2013-16

Mohammed Jawad MBBS[1], Hazel Cheeseman MSc[2], Leonie S. Brose PhD[3]

[1]Public Health Policy Evaluation Unit, Imperial College London, Hammersmith, London, W6 8RP; mohammed.jawad06@imperial.ac.uk; Tel: +44 (0) 207 5943 368; Fax: +44 (0) 207 594 1974

[2]Action on Smoking and Health, 67-68 Hatton Garden, London, UK

[3]Department of Addictions, Institute of Psychiatry, Psychology and Neuroscience, King's College London, UK

Word count: 2151

ABSTRACT

Background

One percent of adults in Great Britain use waterpipe tobacco at least monthly, however national epidemiological evidence among young people is absent. This study aims to assess waterpipe tobacco prevalence and correlates among young people in Great Britain.

Methods

Data were analysed from online surveys conducted annually from 2013 to 2016 with weighted national samples of 11 to 18-year olds in Great Britain (annual n=1936 to 2059). Primary outcome measures were at least monthly waterpipe tobacco use and lifetime waterpipe tobacco use. Binary logistic regression models tested the association between these outcomes and age, sex, country of residence, and other tobacco consumption.

Results

Between 2013 and 2016, 1.7% (95% CI 1.5-2.1%) used waterpipe tobacco at least monthly and 9.9% (95% CI 9.2-10.7%) used waterpipe in their lifetime. There were no changes in prevalence over time. At least monthly use was associated with older age groups (16-18 years vs. 11-15 years, adjusted odds ratio (AOR) 2.63, 95% CI 1.55-4.46), male sex (AOR 1.82, 95% CI 1.23-2.71) and other tobacco consumption (e.g. lifetime cigarette use AOR 10.30, 95% CI 5.22-20.29). Lifetime use had similar correlates, but was not associated with male sex (AOR 0.97, 95% CI 0.80-1.17).

Conclusions

One in ten young people in Great Britain have tried waterpipe tobacco, though more frequent use appears low. We found no evidence of increasing or decreasing prevalence of waterpipe use between 2013 and 2016. Being male, older, and a concurrent user of other tobacco products were correlated with waterpipe tobacco use.

Keywords

Waterpipe; hookah; shisha; tobacco; young people; adolescents

INTRODUCTION

Waterpipe tobacco smoking describes the use of a water-filled apparatus through which tobacco smoke, usually fruit flavoured, is passed prior to inhalation. A centuries-old practice traditionally smoked in parts of the Middle East and south Asia by elderly males, waterpipe tobacco use has now spread to Western settings and to young people of both sexes[1, 2]. *Mo'assel* (Arabic for 'honeyed') waterpipe tobacco is thought to contain 30% tobacco and is laced with molasses, fruit flavours and glycerine[3]. Its sweet taste, range of fruit flavours, and lack of marketing regulation in many countries may have generated the perception among users that waterpipe tobacco is less harmful than cigarettes[4], though recent systematic reviews and meta-analyses of the health effects of waterpipe tobacco suggest a similar detrimental health effect profile to cigarettes[5, 6]. A small survey among commercial waterpipe premises in London suggested that over 90% of the tobacco consumed was *Mo'assel*[7]; the remainder was likely to be a more traditional and unflavoured type of tobacco, possibly with a higher nicotine content[8].

Waterpipe tobacco smoking is a stationary tobacco use method whose sessions usually last an average of one hour each. This feature generally results in intermittent, non-daily use, and measures to capture patterns of use are likely to differ from those used to capture patterns of use for cigarettes (such as current or daily use)[9]. One often-used measure, recommended specifically for waterpipe tobacco epidemiology, is past-30 day use[10]. National surveys from the US suggest that in 2015, 1.5% of adults[11] and 7.2% of high school students[12] were past-30 days users of waterpipe tobacco and among high school students this has risen from 4.1% in 2011[12, 13]. Compared with other tobacco products, waterpipe tobacco prevalence is the most evenly distributed across sex and ethnicity in the US[12]. Adult prevalence data from the 2012 Eurobarometer Surveys indicate that daily or occasional waterpipe tobacco use range from as low as 0.4% in Romania to 9.0% in Lithuania[14]. For young people, past-30 day prevalence ranges from as low as 2.2% in Romania to 22.7% in Latvia [15].

In Great Britain, the 2012 Eurobarometer Survey reported that 3.6% of adults were daily or occasional users[14]. The 2012/13 online YouGov survey among adults demonstrated that 11.6% had tried waterpipe tobacco in their lifetime, and 1.0% used waterpipe tobacco at least monthly[16]. Males,

younger age groups, ethnic minority groups, and high socioeconomic groups were independently associated with waterpipe tobacco use after adjustment. Furthermore, among 18-24 year olds adults in Great Britain, the prevalence of frequent use (at least once or twice a month) was 6.8% among daily cigarette smokers but 2.2% among never smokers[16]. Another street-based survey of adults in one area of London showed that lifetime waterpipe use was equally high as lifetime cigarette use, at around 30%, though with non-probabilistic sampling method this was unlikely to be representative [17].

In Great Britain, waterpipe tobacco is governed by an array of tobacco control laws, including the prohibition of sale to under 18s. However, to the best of our knowledge there are no national estimates of waterpipe tobacco smoking among young people in Great Britain. Local estimates from parts British cities suggest that regular or occasional waterpipe prevalence ranged between 2.7% and 7.6%[18, 19], and lifetime use ranged between 12.0% and 39.6%[18, 20, 21].

Given the high prevalence estimates in some Western settings, particularly among young adults, there is a need to better understand prevalence of waterpipe tobacco smoking among young people in Great Britain. This can help guide and prioritise tobacco control efforts, and initiate interventions to prevent initiation and promote cessation. Therefore, the aim of this study was to assess waterpipe tobacco smoking prevalence among young people in Great Britain and describe patterns of change over time.

METHODS

Design, setting, sampling

This was a repeat cross-sectional survey among 11 to 18 year olds in Great Britain, using identical sampling methods and survey instruments each year between 2013 and 2016. The sample was drawn from an online panel developed by YouGov PLC, an international, internet-based market research and data analytics firm[22]. Recruitment to the panel was through various online and offline sources, including advertising and strategic partnerships with a broad range of websites. YouGov uses proprietary software to draw a nationally representative sub-sample. Given the YouGov panel only includes those aged 16 or over, young people aged 16 to 18 years were recruited and consented

directly from the YouGov panel, while those aged 11 to 15 years were recruited via email to panel members who serve as legal guardians, where parental/guardian assent and individual consent was taken. Data from these samples were weighted to be representative of age, gender and region of Great Britain, which was derived from the Office for National Statistics census data. The sample sizes of the 2013, 2014, 2015, and 2016 samples were 2,062, 1,952, 1,943, and 2,019, respectively.

Measures

Respondents were first asked about their awareness of waterpipe tobacco using the question: "Shisha pipes are large pipes that draw smoke through water. They are sometimes called hookah or waterpipes. Have you ever heard of shisha smoking?". Those responding "Yes, I have" were then asked the following: "Which ONE of the following is closest to describing your experience of shisha smoking?" Available response options were A) I have never used shisha; B) I have tried shisha once or twice; C) I use shisha sometimes (more than once a month); D) I use shisha often (more than once a week); and E) Don't want to say. Those providing positive responses to option B were considered to have had 'lifetime use', and those providing positive responses to options C or D were considered 'at least monthly' waterpipe tobacco users. Those providing positive responses to option E were excluded from analyses (n=22 across all four surveys). Those who had never heard of waterpipe from the initial question were considered never users.

We merged four years of survey data into one dataset, and randomly distributed repeat responders into one of these four years. Our dependent variables were at least monthly waterpipe tobacco use and lifetime waterpipe tobacco use. Our independent variables were age (categorised into 11 to 15 years or 16 to 18 years), sex (female or male), lifetime cigarette use (yes or no), less than weekly, weekly, or daily cigarette use (yes or no), lifetime electronic cigarette (e-cigarette) use (yes or no), and country of residence (England, Wales, or Scotland).

Statistical analysis

We ran descriptive statistics (frequency counts, weighted percentages) to describe our sample. We calculated the prevalence of at least monthly or lifetime waterpipe tobacco use across the full sample

and stratified by our independent sociodemographic variables. We broke this down into yearly stratifications to identify patterns across each year. Finally, we identified the correlates of at least monthly or lifetime waterpipe tobacco use using binary logistic regression. This was conducted across all four years of survey data, with the year of survey included as an additional independent variable to assess whether waterpipe tobacco smoking had changed over time. We used survey weights to account for the study design and conducted all analyses in Stata 12.0 (StataCorp), reported weighted percentages or adjusted odds ratios (AORs) with 95% confidence intervals (95% CI).

Ethics statement

Members of the panel consent to completing surveys for YouGov in return for a modest financial incentive, and additional ethical approval was not sought due to this pre-existing consent. This study was an analysis of routinely collected national tobacco surveillance data and was considered exempted from institutional review board approval.

RESULTS

Sample characteristics

We included 7,954 observations (between 1,936 and 2,059 observations per year) in our analysis and Table 1 presents the sample characteristics. Approximately 60% of the sample were aged 11 to 15 years, 51% were male, and 87% lived in England. About 21% had ever tried cigarettes, 7% were less than weekly, weekly, or daily cigarette users, and 10% had ever tried e-cigarettes (of whom 14% used e-cigarette at least monthly).

Waterpipe tobacco prevalence and correlates: 2013-16 combined

Table 2 presents the prevalence of waterpipe tobacco use. Across all four survey years the prevalence was 1.7% (95% CI 1.5-2.1%) for at least monthly use and 9.9% (95% CI 9.2-10.7%) for lifetime use.

Table 3 presents the correlates of waterpipe tobacco use, pooled across all survey years. In general, both measures of waterpipe tobacco prevalence were independently associated with age, lifetime cigarette use, and lifetime e-cigarette use, and not associated with the year of survey. The latter

suggests no evidence of increasing or decreasing use in later surveys compared with the 2013 survey. For at least monthly waterpipe tobacco use, males had higher odds of use compared with females, but this was not seen for lifetime use. For lifetime waterpipe tobacco use, less than weekly, weekly or daily cigarette users had higher odds of waterpipe tobacco use compared with non-cigarette users , and Scotland residents had lower odds of use compared with England residents.

DISCUSSION

In this sample of young people from Great Britain, 1.7% used waterpipe tobacco at least monthly and 9.9% had tried waterpipe tobacco in their lifetime. We found no evidence of increasing or decreasing trends in use between 2013 and 2016. Use of other tobacco or nicotine-containing products (cigarettes, e-cigarettes) was independently associated with waterpipe tobacco use. Additionally, lifetime and at least monthly waterpipe tobacco use was more common among older age groups, and at least monthly use was also more common among males.

We were able to compare our lifetime use estimates to surveys in other countries that also targeted 11 to 18 year olds. Our lifetime use estimate of 9.9% is lower than that reported in Germany (28.9%)[23] and Finland (15.3%)[24], but more in line with that reported from the US (7.4% to 14.3%) [25, 26]. Comparing our at least monthly use estimate of 1.7% to the literature is more challenging given most studies report past-30 day use, a construct which captures both regular, occasional, rare users, and those who tried once without an acknowledgement of smoking history. However two other studies worldwide have reported at least monthly use among youth, one subnational survey from Iran (5.3%)[27] and another city-wide survey from Istanbul, Turkey (19.0%)[28]. Our correlates, showing higher use in older youth groups, and among males, are broadly similar to the existing literature[1, 15].

This study highlights that at least monthly waterpipe tobacco use among youth is at least as prevalent as among adults in Great Britain (1.7% vs. 1.0%)[16]. From a research perspective, surveillance of waterpipe tobacco in Great Britain should continue, and additional measures of use should be added to better capture inequalities by ethnicity and socioeconomic groups, and more sensitive measures of

frequency, intensity of use, and exposure, such as sharing patterns and length of waterpipe sessions, so that the public health harm can be better estimated[9]. For some population groups where waterpipe tobacco use is higher (e.g. among concurrent cigarette or e-cigarette users), consideration should be given to the development, testing and validation of prevention and cessation interventions. The extent to which cigarette or tobacco-generic interventions can apply to waterpipe tobacco use remains uncertain[29]. This is because waterpipe tobacco has distinct features that drive consumption, such as the presence of waterpipe-serving premises, the dominance of flavoured tobacco, preparation rituals, and sharing behaviours between co-users[4, 30].

From a policy perspective, waterpipe tobacco prevalence among youth is low and is generally well-covered by existing national tobacco control laws in Great Britain, however waterpipe-serving premises are an area which could warrant further policy attention. For example, a cross-sectional study in London showed that over a third of young people who were regular or occasional waterpipe tobacco users took their first puff illegally (i.e. underage) in a waterpipe-serving premise[18]. In another study conducted in a deprived city in England, over a quarter of young waterpipe tobacco users cited waterpipe-serving premises as their usual smoking location[19]. While underage use is commonly reported in epidemiological studies of cigarette use[31], the involvement of dedicated waterpipe-serving premises raises the issue of whether such premises should be better regulated through the use of licensing powers, for example.

To our knowledge this is the first study to report national estimates and correlates of waterpipe tobacco smoking among young people in Great Britain. Several limitations should be noted. The repeat cross-sectional design of the study may limit our ability to comment on trends; however the identical survey design and survey instrument provides adequate information for surveillance. The survey omitted important socioeconomic variables, however we expect these to show that waterpipe tobacco use is higher among more educated and wealthier groups[16, 18]. We were also unable to ascertain a response rate to evaluate the likelihood of non-responder biases.

To conclude, waterpipe tobacco is used by 1.7% of youth in Great Britain on an at least monthly basis, with no evidence in increasing or decreasing prevalence of use between 2013 and 2016. Continued surveillance is warranted to better understand any changing patterns of use.

FUNDING

Leonie Brose is funded by a Cancer Research UK (CRUK)/BUPA Foundation Cancer Prevention Fellowship (C52999/A19748). The Public Health Policy Evaluation Unit at Imperial College London is supported by funding from the NIHR School of Public Health Research.

CONFLICTS OF INTEREST

None declared

ACKNOWLEDGEMENTS

This study uses data which YouGov collected and shared with the authors who conducted all analyses reported here.

KEY POINTS

- Very little is known about the epidemiology of waterpipe smoking among young people in Great Britain
- We found one in ten young people in Great Britain have tried waterpipe tobacco, while frequent use was low
- Further policy attention could be given to the commercial waterpipe-serving premises, including licensing powers to prevent underage use

REFERENCES

[1] Maziak W, Taleb ZB, Bahelah R, *et al.* The global epidemiology of waterpipe smoking. *Tob Control* 2015;**24 Suppl 1**:i3-i12.

[2] Akl EA, Gunukula SK, Aleem S, *et al.* The prevalence of waterpipe tobacco smoking among the general and specific populations: a systematic review. *BMC Public Health* 2011;**11**:244.

[3] Knishkowy B, Amitai Y. Water-pipe (narghile) smoking: an emerging health risk behavior. *Pediatrics* 2005;**116**(1):e113-119.

[4] Akl EA, Ward KD, Bteddini D, *et al.* The allure of the waterpipe: a narrative review of factors affecting the epidemic rise in waterpipe smoking among young persons globally. *Tob Control* 2015;**24 Suppl 1**:i13-i21.

[5] Waziry R, Jawad M, Ballout RA, *et al.* The effects of waterpipe tobacco smoking on health outcomes: an updated systematic review and meta-analysis. *Int J Epidemiol* 2016.

[6] Raad D, Gaddam S, Schunemann HJ, *et al.* Effects of water-pipe smoking on lung function: a systematic review and meta-analysis. *Chest* 2011;**139**(4):764-774.

[7] Kassim S, Al-Bakri A, Al'Absi M, *et al.* Waterpipe tobacco dependence in U.K. male adult residents: a cross-sectional study. *Nicotine Tob Res* 2014;**16**(3):316-325.

[8] Neergaard J, Singh P, Job J, *et al.* Waterpipe smoking and nicotine exposure: a review of the current evidence. *Nicotine Tob Res* 2007;**9**(10):987-994.

[9] Maziak W, Ben Taleb Z, Jawad M, *et al.* Consensus statement on assessment of waterpipe smoking in epidemiological studies. *Tob Control* 2016.

[10] Maziak W, Ward KD, Afifi Soweid RA, *et al.* Standardizing questionnaire items for the assessment of waterpipe tobacco use in epidemiological studies. *Public Health* 2005;**119**(5):400-404.

[11] Salloum RG, Thrasher JF, Kates FR, *et al.* Water pipe tobacco smoking in the United States: findings from the National Adult Tobacco Survey. *Prev Med* 2015;**71**:88-93.

[12] Singh T, Arrazola RA, Corey CG, *et al.* Tobacco Use Among Middle and High School Students--United States, 2011-2015. *MMWR Morb Mortal Wkly Rep* 2016;**65**(14):361-367.

[13] Centers for Disease Control and Prevention (CDC). Tobacco product use among middle and high school students--United States, 2011 and 2012. *MMWR Morb Mortal Wkly Rep* 2013;**62**(45):893-897.

[14] Agaku IT, Filippidis FT, Vardavas CI, *et al.* Poly-tobacco use among adults in 44 countries during 2008-2012: evidence for an integrative and comprehensive approach in tobacco control. *Drug Alcohol Depend* 2014;**139**:60-70.

[15] Jawad M, Lee JT, Millett C. Waterpipe Tobacco Smoking Prevalence and Correlates in 25 Eastern Mediterranean and Eastern European Countries: Cross-Sectional Analysis of the Global Youth Tobacco Survey. *Nicotine Tob Res* 2016;**18**(4):395-402.

[16] Grant A, Morrison R, Dockrell MJ. Prevalence of waterpipe (Shisha, Narghille, Hookah) use among adults in Great Britain and factors associated with waterpipe use: data from cross-sectional Online Surveys in 2012 and 2013. *Nicotine Tob Res* 2014;**16**(7):931-938.

[17] Jawad M, Power G. Waterpipe tobacco and electronic cigarette use in a southeast London adult sample: a cross-sectional analysis. *J Public Health (Oxf)* 2016;**38**(2):e114-121.

[18] Jawad M, Wilson A, Lee JT, *et al.* Prevalence and predictors of water pipe and cigarette smoking among secondary school students in London. *Nicotine Tob Res* 2013;**15**(12):2069-2075.

[19] Jawad M, McIver C. Waterpipe tobacco smoking prevalence and illegal underage use in waterpipe-serving premises: a cross-sectional analysis among schoolchildren in Stoke-on-Trent. *Public Health* 2017;**146**:32-38.

[20] Jawad M, McIver C, Iqbal Z. Prevalence and correlates of lifetime waterpipe, cigarette, alcohol and drug use among secondary school students in Stoke-on-Trent, UK: a post hoc cross-sectional analysis. *J Public Health (Oxf)* 2014;**36**(4):615-621.

[21] Jawad M, Power G. Prevalence, correlates and patterns of waterpipe smoking among secondary school students in southeast London: a cross-sectional study. *BMC Public Health* 2016;**16**:108.

[22] YouGov UK. Home [online]. Available at: https://yougov.co.uk/ [Date of access 02 November 2017].

[23] Kuntz B, Lampert T. [Waterpipe (shisha) smoking among adolescents in Germany: Results of the KiGGS study: first follow-up (KiGGS Wave 1)]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2015;**58**(4-5):467-473.

[24] Kinnunen JM, Ollila H, El-Amin Sel T, *et al.* Awareness and determinants of electronic cigarette use among Finnish adolescents in 2013: a population-based study. *Tob Control* 2015;**24**(e4):e264-270.

[25] Arrazola RA, Singh T, Corey CG, *et al.* Tobacco use among middle and high school students - United States, 2011-2014. *MMWR Morb Mortal Wkly Rep* 2015;**64**(14):381-385.

[26] Ambrose BK, Day HR, Rostron B, *et al.* Flavored Tobacco Product Use Among US Youth Aged 12-17 Years, 2013-2014. *Jama* 2015;**314**(17):1871-1873.

[27] Fakhari A, Mohammadpoorasl A, Nedjat S, *et al.* Hookah smoking in high school students and its determinants in Iran: a longitudinal study. *Am J Mens Health* 2015;**9**(3):186-192.

[28] Evren C, Evren B, Bozkurt M. Tobacco use among 10th grade students in Istanbul and related variables. *Asian J Psychiatr* 2014;**8**:69-75.

[29] Jawad M, Jawad S, Waziry RK, *et al.* Interventions for waterpipe tobacco smoking prevention and cessation: a systematic review. *Sci Rep* 2016;**6**:25872.

[30] Akl EA, Jawad M, Lam WY, *et al.* Motives, beliefs and attitudes towards waterpipe tobacco smoking: a systematic review. *Harm Reduct J* 2013;**10**:12.

[31] Mathers M, Toumbourou JW, Catalano RF, *et al.* Consequences of youth tobacco use: a review of prospective behavioural studies. *Addiction* 2006;**101**(7):948-958.